

In the drawings:

Substitute the accompanying three drawing sheets 1/3-3/3 for the pending drawings.

REMARKS

A response to the outstanding Office Action was due March 27, 2005. A request for a two-month extension of time and the associated fee are enclosed. Accordingly, this Response is timely filed.

Reconsideration of this application, as amended, is respectfully requested. By this Amendment, section headings have been added to the specification, and minor informalities therein corrected. On page 6, a reference to original figure 4 has been added to the specification, as required by the Examiner.

A description of new figures 5-7 has been added to the Brief Description of the Several Views of the Drawings.

In the drawings, figures 1 and 2 have been labeled as Prior Art, reference characters have been added to figure 4, and new figures 5-7 illustrating the features of original claims 3-5 have been added. The addition of "new matter" has been scrupulously avoided.

In the claims, claim 1 has been amended and new claims 8, 9 and 10 have been added to more particularly point out and distinctly claim the subject invention. Claims 1-10 remain in this case.

In the initial Office Action, the original disclosure was objected to because the elements shown in figure 4 were allegedly not mentioned in the body of the specification. In response to this objection, Applicant notes that many of the elements of figure 4 are common with those in figure 3 and are described. A further description of one aspect of figure 4 has been added to page 6 of the specification. In view of the above, the Examiner is requested to reconsider and withdraw this objection.

The original drawings were objected to because figures 1 and 2 were not labeled as Prior Art, and because it was alleged that they did not show every feature of the invention specified in the claims.

Replacement drawing sheets are being submitted under cover of a separate letter to the Official Draftsperson. In the replacement sheets, figures 1 and 2 are now labeled with the legend Prior Art, reference characters E and g have been added for clarity to figure 4, and new figures 5-7 clearly illustrating the features of original claims 3-5 have been added.

Additionally, with regard to the features of claim 1, as now presented, Applicant notes that the single module containing the components for electrical measurement of active power

and/or active currents absorbed by the motor and the means for digital monitoring are identified as "E", in figure 3, and the galvanic and electromagnetic isolation are identified by reference characters f and e, respectively, in the same figure.

In view of the above explanation and the accompanying replacement drawing sheets, the Examiner is requested to reconsider and withdraw the original drawing objections.

Original claim 1 stands rejected under 35 U.S.C. 112, 1st paragraph as allegedly failing to comply with the enablement requirement. More particularly, the Examiner asserts that there is no hardware circuitry shown in the drawings for "means for digital monitoring of tool wear, absence and breakage simultaneously using the power, an integral of the power and a derivative of the power to detect a defect in a type of machining operation, by comparison with a reference curve established during a first machining operation performed by the tool". The Examiner further states that it also is not explained in detail in the specification where the power, the integral of the power and the derivative of the power come from and how they are used to detect the defect of the machining operation and where the comparator is connected in order to perform the comparison operation.

Applicant respectfully but most strenuously traverses this rejection. Applicant submits that those skilled in this art would be able to make and use the claimed invention based upon the original disclosure and their knowledge of the prior art.

As shown in Prior Art figures 1 and 2 of the present application, a tool wear and breakage monitoring device D is generally known in the prior art. See also processing unit 34 of the applied Shiozakj et al. reference (U.S. patent 5,921,726). As taught on page 7 of the original specification, the functions of Applicant's claimed means for digital monitoring are preferably performed by a microcontroller. Such equipment is exceedingly well known, as is software for implementing the designated functions.

For the above reasons, the Examiner is respectfully requested to reconsider and withdraw the rejection of claim 1 under 35 U.S.C. 112, 1st paragraph.

Original claims 1 and 3-7 stand rejected under 35 U.S.C. 103(a) as allegedly obvious over Applicant's admitted prior art (figure 1 of this application) in view of Shiozakj et al. This rejection, to the extent that it might be deemed applicable to the claims as now presented, is respectfully but most strenuously traversed.

One of the key features of the present invention is the integration of the electrical parameter measuring components within a single module, with means for digital monitoring of tool wear, absence and breakage, while simultaneously using the power, an integral of the power and a derivative of the power to detect a defect in a machining operation, by comparison with a reference curve established during a first machining operation performed by the tool.

Previously, tool wear and breakage monitoring devices have detected tool wear and absence by measuring the energy, i.e. the integral of the power signal, and detected tool fracture and absence by measuring power.

The integrated approach of the present invention makes it possible to utilize a third physical quantity, i.e. the derivative of the power and/or of the current, as a further monitoring check.

Supervision of tools fitted with tips or of multi-tool heads, using only energy and power is not reliable enough to detect the fracture of a tip or of a tool. The simultaneous combination of monitoring via the power, the energy and the derivative of power, according to the present invention, appreciably improves the detection of tool wear and/or breakage.

There is no recognition in either the admitted prior art or the Shiozakj et al. reference of using the derivative of the power in this advantageous fashion. Certainly there is no teaching of using a curve of the derivative of the power signal to detect the breakage or wear of the tool of the machine by comparing it to a reference curve established from initial machining performed by the tool. Moreover, there is no teaching, disclosure or suggestion in the applied prior art of using the combination of power, the integral of the power signal and the derivative of the power signal simultaneously to ensure the reliability of the detections.

In the applied reference, the system memorizes the remaining energy absorbed during the work cycle in order to inject air into the bearings of a machine-tool spindle to bring down machining noise. The reference compares a present consumption power $PW1$ with a reference consumption power $PW2$ but clearly does not divulge a numerical control simultaneously using the power, energy and derivative of the power to control and prevent tool breakage on machines performing repetitive operations. There is no mention in this reference of the use of the power derivative nor of comparing same to a reference curve established during a first machining operation performed by the tool.

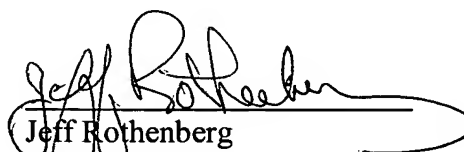
Accordingly, Applicant respectfully submits that the combined prior art does not teach the invention as defined by amended claim 1. The dependent claims are allowable for the same reasons as independent claim 1 from which they all ultimately depend, as well as for their additional limitations.

There is nothing in the secondary reference to Klaus et al. which would overcome the above-described deficiencies of the basic combination of references.

For all of the above reasons, the claims in this application are believed to be in condition for allowance, and such action is respectfully requested.

If it would advance the prosecution of this application, the Examiner is cordially invited to contact Applicant's representative at the below listed telephone number.

Respectfully submitted,


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